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Innovation and Entrepreneurship:
Clustering Activity of the Alberta Food Industry

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by

Jolene Fae Ali

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of

Master of Business Administration/Master of Agriculture

Department of Rural Economy

Edmonton, AB
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University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled **Innovation and Entrepreneurship: Clustering Activity of the Alberta Food Industry** submitted by **Jolene Fae Ali** in partial fulfillment of the requirements for the degree of **Master of Business Administration/Master of Agriculture**.

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Date: June 3rd, 2005

EXECUTIVE SUMMARY

In Canada, food manufacturing is the second largest manufacturing industry after transportation equipment and the largest employer of manufacturing labour. Canada is also home to some of the world's largest food manufacturers. However, Canadian food manufacturers lag behind multinationals operating in Canada in terms of innovation and use of innovation instruments, such as trademarks and patents. There are several government resources available to the Alberta food industry, such as the Food Processing Development Center and the Alberta Research Council, which can assist in the commercialization and development of new food products. The objective of this study is to identify what evidence there is evidence for an innovation cluster in the Alberta food industry. A survey was issued to industry participants. According to the responses to the selected survey criteria, innovation and communication were judged to be unacceptable by survey participants. There are many tools available to improve communication within an industry and to consumers, such as trade shows, seminars and commodity groups. Despite interest among some of the survey respondents in such activities, there is little development of these communicative interactions within the Alberta food industry to date. Survey respondents cited a lack of capital, investment and interest in innovation as possible reasons for this lack of utilizing available communication tools. In conclusion, there is little evidence of an established innovation cluster in the Alberta food industry.

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INTRODUCTION AND STUDY OBJECTIVES

At the most basic level, clusters are natural business formations. They evolve when a concentration of a number of key business elements emerge in one geographical area. Examples of such key elements within a cluster are businesses, infrastructure, investors, educational institutions, logistical resources, suppliers and human resources. Formation of a business cluster is often unforeseen and can be the result of one or two successful companies that become role models or cluster leaders for other less successful but developing companies in the region, as well as new entries into the local market. These successful firms create a demand-pull effect and draw a variety of high quality resources into the area, such as human resources, raw materials and auxiliary services. This flood of resources into the region often results in a spill-over of assets into the community at large, thus creating a positive externality. As a whole, the community can benefit from the influx of assets through sustained economic growth and prosperity. According to Porter (1998), "being part of a cluster allows companies to operate more productively in sourcing inputs, accessing information, technology and needed institutions, coordinating with related companies and measuring and motivating improvement" (p. 81).

Clusters form around the endowments of a region, and tend to develop where required inputs are inexpensive and abundant. Two famous Canadian wine clusters can be found in the Okanagan Valley and in Southern Ontario. In the case of the Ontario cluster, wineries in the region joined together for the purpose of promoting Ontario wines in an increasingly competitive and global market. Implementation of the North American Free

Trade Agreement (NAFTA) forced Ontario wine growers to become globally competitive very quickly to survive (Holbrook and Wolfe 2004). Ontario's share of the North American wine market faced competition from better quality American and Mexican wines and as a result, Ontario wine producers went through a period of hardship. To compete effectively and survive the new market reality, the Ontario wine producers were forced to pull up acres of low quality grapes and replant fields with high quality vines to improve the quality of their products quickly. Without the wine industry cluster it would have been very difficult for individual producers to change the quality and image of Ontario wines so dramatically in such a short period of time.

Governments, at all levels, have a great deal of interest in the promotion and growth of clusters (Porter, 2000), to encourage sustained economic and regional growth. Government involvement with the development of clusters can be direct or indirect. Indirectly, for example, governments can build and fund universities by supplying grant money to researchers who are working in targeted fields, allocating scholarships to students working in these areas and promoting and funding student internships to get new researchers interested in the targeted fields. Instances of direct government influence on cluster development is when they provide companies with R&D tax credits, as well as give money without delay to companies working on commercializing products through matching research grants. Further, government can directly provide subsidized loans to companies exploring new technology that may not be eligible for funding through traditional means. Governments can also build and staff research institutions and facilities to directly promote clusters and. Ultimately, it is the identification of clusters

that provides governments with the potential to target funding more effectively. However, regardless of government influences, it has been recommended that clusters should be market driven and that companies within targeted clusters should become independently sustainable in the long term (Porter, 1998).

Given the resources available to the Alberta food industry, we could expect a food industry cluster to emerge; Alberta has favourable endowments, such as excellent agriculture inputs, a plethora of small emerging food companies, several large established food companies, educated and knowledgeable human resources, and extensive government and institutional support. Therefore, the purpose of this study is to examine the current food industry cluster environment in Alberta, determine whether there is a cluster forming and, if so, at which stage of the cluster life cycle it exists.

Innovation Clusters - An Overview

It has been argued that increased innovative activity can be used to mitigate Canada's low productivity as compared to the United States (Dachraoui et al., 2003). Canadian companies consider innovation a means to control their outputs, by lowering the cost of manufacturing, human resource sourcing, information collection and new technology implementation. Furthermore, countries focusing on innovation are richer and grow faster, post better financial performance and have higher share prices (Morck et al., 2001). Not surprisingly, the Canadian government places a high priority on establishing innovation clusters (Industry Canada, 2001).

Some governments may see innovation clusters as a panacea that will suddenly bring growth and prosperity to a region. However, it is risky to assume that encouraging the formation of a specific cluster will be prosperous, unless all the actors are willing and active participants. Further, Porter (2000) suggests that "government should reinforce and build on established and emerging clusters rather than attempt to create entirely new ones" (p. 26). In sum, governments are at risk when they promote innovation clusters without a good understanding of the current business environment and the specific needs of the firms within the cluster.

What is a cluster?

> Clusters are geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and companies in industries related by skills, technologies, or common inputs. Finally, many clusters include government and other institutions – such as universities, standards-setting agencies, think tanks, vocational training providers, and trade associations – that

> provide specialized training, education, information, research and technical support. (Porter, 1998, p. 78)

The specifics of clusters are not fully understood and can be very diverse. Possibly the most important factor in cluster identification relates to the information flows. How, when and to whom information is shared are the basic components of a cluster identity. Recognizing specific industry sectors is one way of identifying a cluster, however, the most effective clusters reach far beyond specific industry sectors. In fact, some of the most significant information flows are between unrelated industries, since firms are naturally more likely to share information with each other if they are not competing directly. Geographic jurisdiction is another identifying factor of a cluster. However, technology clusters exist over large geographic areas and span multiple countries (Porter, 2000). With lower transaction costs of sharing information and using information to create value where it did not exist before, the geographic expansion of clusters are expected to increase in the future.

Munn-Venn and Voyer (2004) suggest that the life cycle of an innovation cluster could be broken down into four distinct stages. In the early stage of a cluster, the cluster is primarily a vehicle for the creation and diffusion of knowledge. Yet at this stage, little substance to the firms participating in the cluster results as many of these firms are introducing new concept products and have not made any substantial commercial gains. The second stage ("growth-stage") of a cluster is when knowledge is rapidly transformed into products and processes. Companies participating in the cluster start to become

internationally recognized and their exports begin to grow. At this point in cluster development, movement of labour between firms occurs, but neither the firms nor the employees incur relocation costs. Munn-Venn and Voyer (2004) suggest that access to skilled labour is important at all stages of cluster development, but it is most critical during the “growth-stage”. The third stage of a cluster cycle is known as the “mature-stage”, and it develops when the number of new entrants into the cluster declines, employment growth slows and cluster firms start to become “cash cows”. Munn-Venn and Voyer (2004) find that research and development (R&D) funding often declines during the third stage. The final stage of a cluster is also known as the “renewal” or “decline stage”. According to Munn-Venn and Voyer (2004), this final stage is he most critical stage of a cluster, as consumer market demands shift away from cluster products or the products made by the cluster become obsolete. The final cluster stage may also see a migration of entrepreneurs and decision makers, ultimately weakening the cluster. On the other hand, a cluster may take the market shift resulting in its movement into the final stage as an opportunity to renew itself, as was the case with the Ontario wine cluster. Considering the implications of the stages of a cluster life cycle, another goal of this study is to determine the current developmental stage of the Alberta food industry cluster.

What is the value of a cluster?

What does a cluster contribute to society and a local economy? A successful cluster attracts the best employees, firms as well as domestic and foreign investors (Porter, 2000). While these benefits of a successful cluster are contingent on how well the cluster

can market itself externally and develop its reputation, a higher concentration of firms within the cluster makes it easier to attract new talent to the region. To attract the firms necessary to build a successful cluster, it is important to provide firms with what they want, and according to Wolfe (2003), a skilled and competent labour force is the most important element. Finally, risk capital is a highly important part of cluster development and the region of a potential cluster must draw private sector investment. Munn-Venn and Voyer (2004) show that young firms will go where the money is, while mature firms attract money to their own locale. Further, local and foreign firms will relocate to a cluster and add value to it once they realize that there is a potential to create more economic value from their own ideas and skills by entering the cluster (Porter, 2000). In sum, clusters can increase their value by attracting talent and investment into the local community, thus creating more economic value from their individual resources.

Risks in clusters

There are several risk factors for firms and the local economy associated with cluster activity and formation. First, the failure to keep knowledge flows open can result in a breakdown in the trust and collaboration amongst firms. Therefore, limiting the access to information flow between firms within a cluster can be a critical impediment for that cluster's evolution and success (Porter, 2000). However, these firms may be at risk of losing their competitive advantage if trade secrets leak out to other firms in the cluster. Thus, intellectual property can become an issue when employees are fluid and move from firm to firm within a cluster. As a result, when companies become large enough, they

move a portion of their business - often the most knowledge intensive portion - outside of the cluster. For example, although Microsoft has a presence in the Silicon Valley cluster, Microsoft's head office is located in Seattle, where there is less risk for their trade secrets to leak to competitors (Porter, 1998). A further risk for a local economy is that it may rely too heavily on one industry cluster for its regional economic growth and prosperity. If the cluster industry declines, the region can be left with little alternate economic activity.

What is the government's role in clustering activity?

Governments can be most helpful when they support clusters indirectly, by ensuring a supportive business environment and removing obstacles to growth (Porter, 2000). According to companies polled by the Conference Board of Canada, governments can support innovation by rewarding winners through favourable fiscal policy (Munn-Venn and Voyer (2004), which also alleviates the unappealing role of government employees picking which companies will or will not be winners. Governments can also facilitate the formation of regional venture capital and angel investor funds to indirectly support clusters, as well as build and fund universities to provide a greater pool of qualified workers. Further, governments can reduce the administrative costs associated with the start-up of clusters and strengthen the linkages between research institutions, firms and government bodies, and thus have important influences on upgrading existing clusters (Porter, 2000).

LITERATURE REVIEW

Journal Case Study: Taiwan

Hu TS, Linb CY, Chang SL. 2005. Technology-based regional development strategies and the emergence of technological communities: a case study of HSIP, Taiwan. Technovation 25:367–380.

To maintain the international competitiveness of Taiwan based companies, the Taiwanese government set up a business friendly environment to foster localized innovation clusters throughout various regions of Taiwan. This study finds that location proximity is key for enhancing networks between companies. The main objective of the Taiwanese government was to give small to medium sized enterprises a boost in competitive advantage and innovation. The authors describe the technology-based, regional development strategies in Taiwan and then analyze the developmental characteristics of the Hsinchu Science Park and surrounding area.

The Taiwanese government chose to develop centralized pockets of research and technology clusters to serve as regional growth engines. Two of these sites are the Hsinchu Science based Industrial Park (HSIP), established in 1980, and the Tainan Science based Industrial Park (TSIP), established in 1995. Taiwan's experience shows that government led projects can be successful, as they stimulate the regional and national emergence of innovation systems and economic development. The primary objective of the government developing HSIP and TSIP was to allow small to medium sized firms to

pursue R&D activities and produce high-tech products. Generally, these parks were located near universities or research institutions. As the authors show, a second purpose of these parks is to promote industrial technologies and upgrades. The government's aim was to attract local firms and to encourage them to participate in R&D. The third purpose of founding HSIP and TSIP was to establish regional industries and promote economic growth.

Hu et al. (2005) collected government statistics and survey data. Surveys and interviews were done with technological professionals in HSIP, and project managers of academic or research institutions located near HSIP (n=268). The respondents worked in integrated circuits industry (45%), computers and peripherals (28%), telecommunications (20%) and optical electronics (7%).

HISP is comprised of 300 companies representing $20.33 billion in revenues. Hu et al. (2005) found that because of knowledge uncertainty, high tech companies still rely on the fact-to-face interactions facilitated by spatial clustering. Therefore, location was found to be an important success factor. The survey results also suggest that incoming R&D allowed for faster release of new technologies and products by the cluster. However, less than 30% of companies collaborated on R&D or product design and the R&D activities mainly involved enhancing existing products or technologies, rather than introducing new innovations. High turnover was reported among the professionals working at the firms, with 53% of the employees planning on changing jobs in the next 2 to 3 years. While 70% of interviewees wanted to work for well-known companies, only 11% were willing

to work for start-ups. Companies working at the same level in the same industry were less likely to collaborate with their direct competitors. Interestingly, 60% of the respondents noted informal social gatherings as the main way to expand their professional networks, while only 20% formed professional relationships through seminars and conferences.

External competition was the main reason for forming local innovation clusters. Companies must be active in the industrial cluster and compete for key resources to lead and remain competitive. Therefore, this study challenges the popular belief that clustering is primarily about resource and information sharing. According to the survey findings of this study, clustering is about staying abreast of what the competition is up to and ensuring that firms within the cluster have access to the best resources available. If a company was not associated with the cluster, they were found to have had a competitive disadvantage.

In sum, the study is characterized by a large sample size of the survey (n=268), but unfortunately, actual survey questions were not reported, nor was a statistical analysis performed.

Journal Case Study: Brazil

Cabral J, Traill WB. 2001. Determinants of a firm's likelihood to innovate and intensity of innovation in the Brazilian food industry. Chain and network science 1(1): 33-42.

This paper focuses on two issues. It explores the conditions required for a firm to innovate, and it analyzes the intensity of innovation in the Brazilian food industry; an industry survey was conducted in 1996 for this purpose. Food firms were first identified through the Brazilian Industrial Classification system, and of the 38,916 firms identified, 1000 firms were selected based on economic activity, firm size (with a minimum size of five employees required) and geographical location. The survey was sent to these 1000 firms, and resulted in 242 valid responses that could be used for statistical purposes.

This study tests ten hypotheses. First, a firm's R&D expenditures are not a good predictor of a firm's likelihood to innovate. Second, R&D expenditures are strongly related to the firm's innovative intensity. Third, external alliances aiming to develop innovation are strong predictors of innovative outputs in food firms. Fourth, the level of investment in technologies externally developed will be statistically significant in both the likelihood to innovate and in the intensity of innovation in the food industry. Fifth, advertising level is not a strong predictor of a firm's likelihood to innovate. Sixth, the advertising level is expected to be significantly associated with a firm's innovative intensity. Seventh, exports are not significantly related to a firm's innovative outputs. Eighth, higher levels of vertical and horizontal diversification are not significantly

associated with a firm's likelihood and intensity to innovate. Ninth, large firms are more likely to innovate and have a higher innovative intensity. Finally, tenth, older firms present a higher likelihood and intensity to innovate.

Following the estimation of a double-hurdle model, the survey results suggest that innovation requires not only the application of R&D, but also the application of different types of innovative assets for sustainable innovation development. The authors suggest that innovation has to move out of the R&D and Engineering departments and into the multidimensional innovation arena. Further, the results suggest that if a firm invests in externally developed technologies, they are three times more likely to be innovative. This suggests that the innovative capacity of food firms may be enhanced with R&D competence. The results also suggest a food firm's likelihood to innovate is not significantly determined by complementary assets in terms of market orientation and vertical and horizontal integration. The size of a food firm does predict the likelihood of innovation, with likelihood growing until a certain size then declining as food firm size increases, forming an inverted U shaped curve. Also, the size and innovative activity is not linear, suggesting that size does not affect innovative activity. Finally, both the likelihood and intensity of innovation is influenced greatly by the level of outsourced R&D. This influence can be associated with a firm's network of private and state institutions.

In conclusion, the authors suggest that firms should target financial resources to update equipment and strengthen links with suppliers to identify their technological possibilities

and constraints and boost innovative and complementary assets. The authors further suggest that firms should also boost R&D links with research agencies and universities. However, the survey did not explicitly explore how much involvement firms have with these research networks. Although such networks were analyzed only indirectly, they seemed to play a role in the innovation process.

Journal Case Study: Belgium

Avermaete T, Viaene J, Morgan EJ, Crawford N. 2003. Determinants of innovation in small food firms. European Journal of Innovation Management 6(1) 8-17.

This paper focuses on innovation trends in small sized food and beverage companies in two regions of Belgium. The purpose of the study is to determine whether the innovation level depends on the age of the company, the company size, and/or the regional economic performance.

The food industry in Belgium is viewed as mature and relatively low tech. However, prior to 2003, firms were forced to change the way they were doing business. These changes were precipitated by new regulations regarding food safety and increased competition. The Belgian food industry was examined for three main reasons. First, it represents one of the most important industrial sectors of the Belgian economy. Second, small sized firms are regarded to be essential to economic development, particularly in rural areas. Third, as opposed to large firms, small and rurally-located firms produce

specialized regional products, and make an important contribution to Europe's cultural diversity.

This study focuses on three variables of innovation: the year the company was established, the company size, and the regional economic performance. The objective of the study was to determine if there is a relationship between innovation and the factors measured above.

Data collection involved surveying small food and drink companies with fewer than 50 employees. The firms were identified through the Belgian Food Federation and quota sampling was used to select 60 enterprises. The final sample included 55 enterprises with a mean company size of 21. The researchers conducted face-to-face interviews with either the top manager or the owner of the firm.

The study reported on five indicators of innovation: did firms introduce a new product over the last five years, did firms substantially modify the process over the last five years, did firms receive hazard analysis critical control point (HACCP) certification, did firms have ISO 9000 certification and did firms participate in the organic food chain? Data were collected on the extent of innovation, including the percentage of sales associated with new products, the number of patents held, the firm's allocation to R&D, and the frequency of introducing new products. The data were analyzed for relationships between company size, age, and regional economic performance.

From the final survey population of 55 respondents, 48 did complete at least one of the identified indicators of innovation, and 37 of the firms introduced more than one indicator. Furthermore, in 24 of the firms, new innovation counted for more than 5% of their total revenues, and in 11 firms, new innovation counted for over 20% of their total revenues. The company age was important with respect to the organic logo: younger firms were more likely to have an organic logo. However, there was no significant relationship between a company's age and its innovativeness. The results also indicate that product innovation, process innovation, and HACCP certification were independent of company size. There is a positive relationship between company size and ISO 9000 certification. Somewhat surprisingly, small companies were found to be more likely to carry out R&D activities compared to large companies. Regional economic performance was independent of HACCP certification, ISO 9000 certification, and organic food identification. However, a significant relationship was found between product and process innovation in the more economically depressed region of Hainaut.

Three conclusions were drawn from the study. First, capital intensive projects, like ISO 9000, are more likely to take place in small firms rather than micro firms. Compared to small firms, low investment projects are more common in micro firms. Secondly, no conclusion could be reached on company age and innovativeness; older firms are more likely to introduce new products in their market segment and young firms are more likely to introduce products that have a larger impact on total sales. Finally, geographical location does not have a statistically significant influence on innovation. However, there

is some indication that firms in the region with better economic performance were less innovative.

In sum, there are two shortcomings of this study. First, the sample size was relatively small. Second, companies with less than 50 employees were excluded from the analysis. Clearly, it would have been interesting to see how small and medium sized companies measure up.

Journal Case Study: International clustering activity

Enright MJ, Kai SH. 2000. Survey on the characterization of regional clusters: initial results. Institute of economic policy and business strategy: competitiveness program. University of Hong Kong. Working Paper.

This study developed a firm level survey to find out information on clusters, cluster policies, and cluster based organizations. The survey was developed with industry professionals from over five continents, and a test survey was conducted in New Zealand. A list of regional development organizations was developed along with a list of known cluster professionals. If more than one questionnaire was received for a particular cluster, the results were averaged. In total, 160 usable responses were collected.

The survey results were as follows:

- Geographic scope: 59% of the respondents considered geographic scope of a cluster to involve the city and surrounding area.

- Breadth: identified by participants as including all the vertically integrated supply chains in one region.
- Depth: the majority of the respondents felt that all aspects of the vertical supply chain are included in the cluster.
- Activity Base: the majority of all firms suggested that the corporate duties required by the cluster are performed within the geographical confines of the cluster.
- Growth Potential: on average, cluster participants experienced sales growth exceeding that of non-cluster firms.
- Innovative capacity: a nearly even distribution was found between technology generators and technology users.
- Competitive position: the majority of firms reported that clusters have significant global sales.
- Governance: most respondents referred to cluster relationships as long term.
- Ownership structure: participating firms were primarily locally owned.
- Cluster type: the members of most clusters regarded themselves as “working” clusters - they have dense interactions that are absent outside of the cluster.
- Government policy: government intervention was found supportive or non-existent rather than catalytic, directive, or interventionalist. All government policies listed for evaluation were rated as unimportant or rated lower on a 1-5 point Likert scale.

The survey is based on the opinions of selected, regional-cluster professionals from several continents. The finding that government policy is found to be unimportant to cluster formation deserves emphasis. Also, the fact that professionals rated the impact of the coordination efforts of specialized cluster organizations as "unimportant" deserves to be emphasized. In sum, this international evidence seems to suggest that intangibles and informal coordination efforts could be more important for sustaining a cluster's competitiveness than formal ones.

Implications for public policy and innovation performance

From the above empirical evidence, the issue of whether government should be involved in innovation and cluster formation is inconclusive. Therefore, several other empirical and theoretical studies are reviewed in this section, specifically with regards to public policy and innovation performance.

Jones and Williams (2000) have suggested that in our increasingly decentralized economy, there is a chronic lack of underinvestment in R&D at the regional level. Martin and Scott (2000) justify increased public spending on R&D to balance out notable market failures. They conclude that there is a need to establish a long-term institutional framework to support basic research, generic enabling research, and commercialization. They call for four basic support structures for clusters: public support for venture markets, high- and low-tech bridging institutes, R&D cooperation, and subsidies and support for the development of technology infrastructure. In Korea, for example,

government-promoted innovation clusters showed great success. According to Lee (2003), the regional research center in Hosco University did just as the government intended. It maintained research cooperation with 27 private firms, five universities, and two public research institutes. The local business environment was greatly improved, and this improvement was credited to the promotion of innovation clusters at the regional level. A more recent study (Lemmens, 2004) suggests that firms outside of clusters have a low, innovative performance under cumulative technological change and that the low, performance of non-participating firms is particularly evident in a disruptive and turbulent technological environment.

The role of clustering activity as part of regional policies has also been studied in depth. Based on an OECD (Organization of Economic Development) study, Arzeni (1996) argues that regional policies of governments should encourage and reinforce clustering and cluster growth. Other authors (Oughton, Landabaso, and Morgan, 2002) are even more cautious about public spending, especially in regionally depressed areas, noting that the model of giving money to economically depressed areas is outdated and does not work. Oughton et al. (2004) suggest that linking industrial and innovation policies is possibly the best way to make use of public funds.

Feser (2002) uses Latin America and the Caribbean, to demonstrate that there are significant innovation effects from formal and informal networking efforts among local firms and support agencies. The author emphasizes that the government's ability to foster or even "spark" innovation clusters is limited. Feser (2002) notes that economic

growth is often the goal of public policy makers, not innovation. Furthermore, governments tend to focus locally. However, Feser (2002) suggests that a larger scale focus may be necessary, especially because of the risk of building up a specialized industry in a geographic area.

Gertler and Wolfe (2004) call for regional strategic planning and suggest that regions have to progress in a way that cultivates their assets. The necessity of research and analysis of the business environment is also emphasized by Feser and Luger (2003). They suggest that it is inappropriate to use cluster development as an economic development tool or as a way to pick industry targets; instead, they suggest that a cost benefit analysis should be used.

Research from Australia suggests that collaborations are the key to innovation clusters (Liyanage 1995). Liyanage (1995) argues that it is important that both the cluster members and the support network are open and broadly focused if they are to contribute to diverse product development and diverse market demands. Clusters should be managed in a flexible way, and allow for engagement in multiple strategic alliances. Liyanage (1995) also suggests that the success of clusters is contingent on how adaptive cluster centers are to the changing external environment: how clusters manage their linkages and integrate internal complementary activities.

Perhaps the most authoritative account of the role of public policy with regards to enabling a desirable business environment for cluster development stems from Michael

Porter. According to Porter (1998), clusters are critical to competition. Similarly, Lagnevik et al. (2003) argue that the innovation process, as part of the cluster development, cannot be separated from a company's strategic and competitive context. Porter (1998) emphasizes that modern competition is based on productivity, and that it is productivity that determines how companies compete, not what sectors they compete in. He suggests that all industries can be highly productive, employ sophisticated methods, and be knowledge intensive. However, the degree of sophistication is dependent on the quality of the local business environment. The implication for clustering activity is that clusters drive productivity in three ways: by increasing the productivity of the companies, driving direction and pace of innovation and finally, and stimulating the formation of new businesses.

Clustering Activity in the Canadian Agri-Food Industry

Food processing is the largest manufacturing sector in seven provinces and accounts for 10 per cent of the share of total manufacturing shipments in Canada. It is also the largest employer of manufacturing labour, accounting for 14% of the manufacturing workforce (Krakar, 2004.) Canada also has an interesting industry structure, since large multinational firms account for 50% of industry output (Krakar, 2004). These Canadian-based firms -McCains, Maple Leaf, George Weston, and Saputo- are some of the largest food manufacturers in the world. Considering Lagnevik et al. (2003) and Phillips (2002), Canada's key food clusters appear to be situated in southern Ontario (produce and food manufacturing) and Saskatchewan (agricultural and food biotechnology).

To understand how a food cluster could form in Alberta and to make meaningful statements about the Alberta food industry, it is important to understand the Canadian business environment. Canada has a unique business and political culture that influences the formation and evolution of clusters. One study found that Canada has a higher proportion of innovating firms in manufacturing as compared to Europe, but a lower share of innovative sales for their innovating firms (Mohnen and Therrien, 2002).

According to Statistics Canada, R&D investment, competencies, and past innovation activities are the three main factors affecting innovation in Canadian manufacturing (Baldwin et al., 2004). Baldwin et al. (2004) also note that the location of the R&D activity is not important. Therefore, the authors suggest that off-site R&D can be just as effective as on-site R&D. Further, Baldwin et al. (2004) find that process innovation can be highly important: companies who implement process innovation are 6% more likely to survive than those who do not, and process innovators have higher productivity growth. The authors conclude that innovation is necessary for long term survival and growth of Canadian manufacturing companies, and that innovation serves to maintain market share when outdated products face declining sales.

When considering Canada's overall competitiveness, it appears that foreign-owned companies outpace Canadian companies in all sectors, in terms of both innovation and innovativeness (Baldwin and Hanel, 2000). It is more likely that foreign firms perform R&D in Canada than Canadian firms of the same size. Furthermore, foreign firms are as

likely as domestic firms to form alliances with local universities and R&D partnerships. Additionally, foreign firms are more likely to use intellectual property rights (such as patents, trademarks, etc.) than domestic firms (Baldwin and Hanel, 2000).

Since the government's role for clustering activity has been discussed above without explicit reference to Canada, the following section lists several examples of federal government programs that assist Canadian companies to innovate.

- **Strategis**: provides links to business development tools that are useful for start up companies, innovators, and links to such resources as venture capitalists and industry associations. (http://strategis.gc.ca/engdoc/main.html). Strategis aims to be useful to new start-up companies as a portal for information.
- **Business Gateway**: a federal government website dedicated to businesses in Canada. (http://businessgateway.ca) The Business Gateway is a tool for early start-up companies.
- **National Research Council (NRC) of Canada**: dedicated to three main research areas: physical science and engineering, life science and information technology, and technology and industry support. The NRC aims to support more established companies that do not have the human resources or facilities to conduct certain types of research.

Understanding the Alberta Business Environment

The Alberta business environment is currently very favourable, although it is characterized by a high labour shortage. The economy is thriving and there appears to be readily available access for companies to various universities and research institutions. Furthermore, the provincial government identified agri-food as a “priority value-added sector” (Alberta Economic Development, 2004), and has plans of doubling agri-food revenues from $9.8 to $20 billion in 10 to 12 years. Nationally, Alberta represents 20% of Canada’s agri-food exports - second only to Ontario.

To help bolster the food industry in Alberta, the provincial government also implemented several programs and policies including:

- **Alberta Agriculture Research Institute (AARI):** designed to fund, coordinate, and promote strategic initiatives in research in the agriculture and agri-food sector.
- **Alberta Value Added Corporation (AVAC):** invests in innovative ideas that add value to agricultural commodities mainly through coaching, knowledge, contacts, and financial resources.

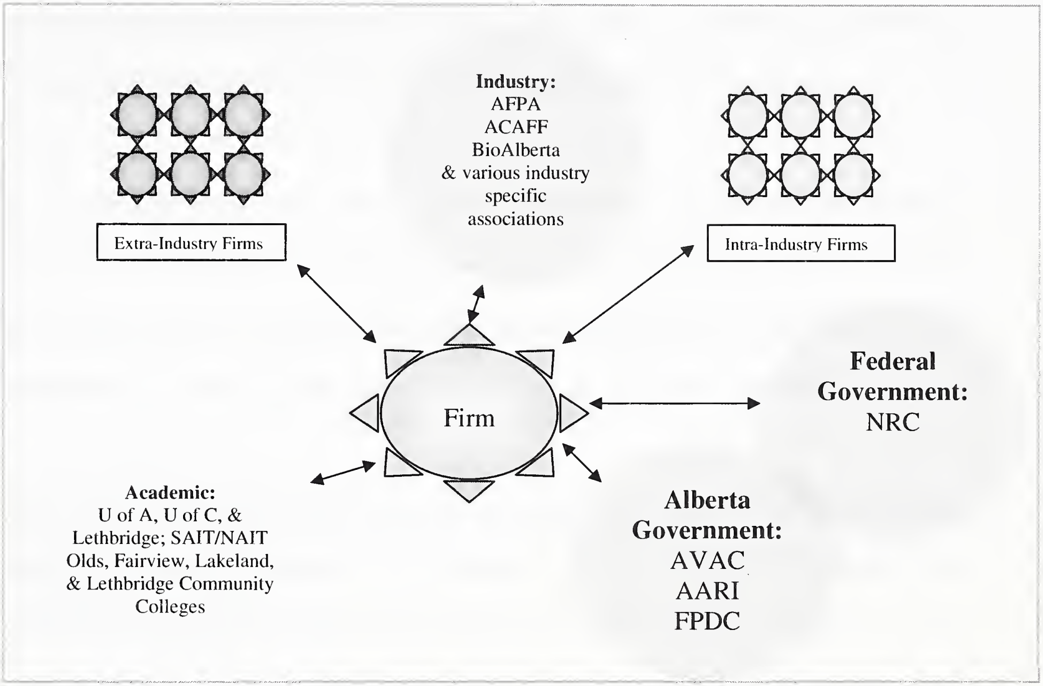
Although the Alberta Government funds AVAC, it is not a government agency and is unique because it acts as an independent corporation. AVAC is a non-profit company with a specific role to increase the value of agricultural products. It is structured like a traditional corporation with a board of directors and an executive management team.

AARI on the other hand, is an arms length government agency governed by a board of directors, which gives money to innovative Alberta-based agri-food companies.

The Alberta government also provides assistance to private firms through the University of Alberta and other government funded research institutions, such as the Food Processing Development Center and the up-and-coming Food Research Center ($5 million). Those centers grant Alberta-based firms subsidies as they charge higher processing fees for firms outside of Alberta.

In conclusion, the subsidies and resources available to the Alberta food-processing sector appear to be outstanding, especially when compared to what food processors have available in Ontario and Saskatchewan. With the robust economy and the academic, industry, and governmental organizations dedicated to doubling the capacity of the food industry in the next ten years, the Alberta sector can be expected to make significant gains in the future. However, considering the above formal and informal networks (as summarized in Figure 1), a key question is to what extent industry participants perceive that the available resources have contributed and will continue to contribute to the establishment of a truly innovative agro-food cluster. Therefore, the objective of the following empirical component of this study is to provide more evidence on the clustering activity in the Alberta food industry.

Figure 1: Resources available to food processors in Alberta


Industry:
AFPA
ACAFF
BioAlberta
& various industry specific associations
Extra-Industry Firms
Intra-Industry Firms
Firm
Federal Government:
NRC
Academic:
U of A, U of C, & Lethbridge; SAIT/NAIT Olds, Fairview, Lakeland, & Lethbridge Community Colleges
Alberta Government:
AVAC
AARI
FPDC

List of Acronyms:

U of A:	University of Alberta
U of C:	University of Calgary
SAIT/NAIT:	Southern/Northern Alberta Institute of Technology
AFPA:	Alberta Food Processor's Association
ACAAF:	Advancing Canadian Agriculture and Agri-food
AVAC:	Alberta Value Added Corporation
AARI:	Alberta Agriculture Research Institute
AFSC:	Alberta Financial Services Corporation
NRC:	National Research Council of Canada

Industry survey

A mail-back survey was developed to achieve two main goals: first, examine the business environment for food companies in Alberta, second, explore to what extent a food cluster is forming in Alberta, and in what stage of formation the cluster is at present.

As the appendix shows, the survey consisted of a series of questions that are related to innovation activities and the business environment. Responses were rated on a Likert scale (unacceptable, acceptable, outstanding, and not applicable). A series of open-ended questions were asked at the end of the survey to upgrade the rating questions.

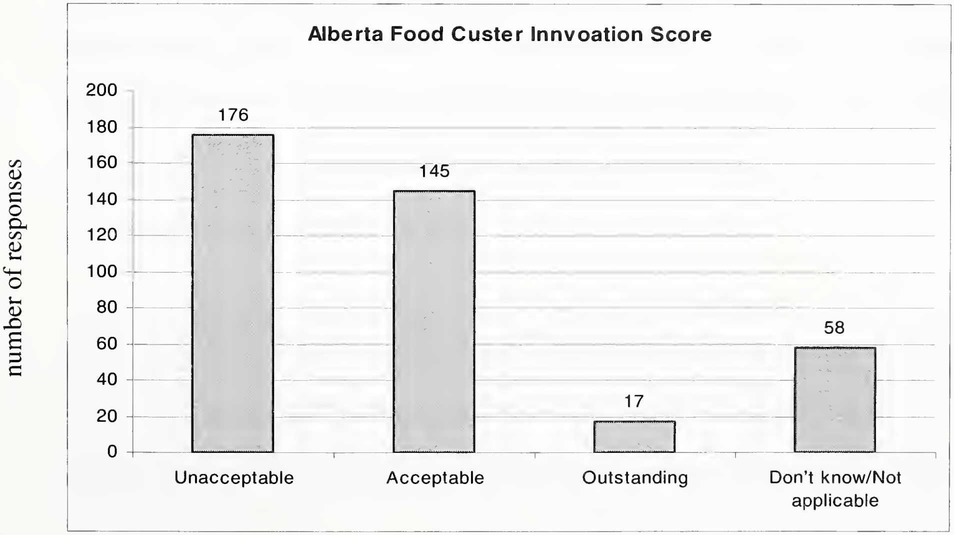
The survey subjects were identified from two main sources: an Alberta food business association directory (Alberta Food Processors Association Business Directory) and through the researchers' professional contacts. The study sample comprised a cross-section of industry professionals, including active members of academia, government, trade associations and private industry - 55 local business professionals were contacted to complete the survey. The subjects were first contacted by phone to determine whether they would, in principal, be willing to participate in the survey. Once they agreed, they received a survey with return envelope by regular mail or through email, depending on the individual's preference. All subjects were asked whether they knew other professionals who would like to fill out the survey as well, in the hope of obtaining additional responses. No monetary incentives were used to increase the response rate.

After two rounds of reminder mails and telephone calls, only thirteen complete surveys were returned in a four-week period. Although the response rate was low, the breadth of the respondents was diverse: Industry (8), government (2), research institutes (1), consulting (1), and commodity group (1). The respondents varied widely in terms of firm size; the largest firm had 2200 employees. Due to confidentiality issues, the identities of the participating firms are not revealed here.

Discussion of results

Overall, the study results suggest that a cohesive innovation environment is missing in Alberta's food industry. Figure 2 shows that amongst all the criteria evaluated, 176 (44.4%) responses deemed the innovation atmosphere as unacceptable, and 145 (36.6%) as acceptable. Only 17 (4.3%) rated any of the chosen innovation criteria to be outstanding.

Figure 2: Survey Results



Interestingly, but not surprisingly, access to capital was a big issue. The responses also suggest that formal and informal networks are very poorly developed and do not contribute significantly to innovative activity.

Further, and perhaps surprisingly, the results suggest that an educated work force is, in principle, accessible to firms (no question related directly to the effect that other sectors have on labour migration out of the agri-food sector). Although universities were categorized as good in producing a skilled workforce, they were not categorized as good in creating fruitful innovation relationships with industry. Weak language skills of university graduates were noted as a limiting factor by respondents.

Perhaps some of the most interesting insights can be drawn from the section of open-ended questions in the questionnaire. When asked what the most important factors were that help to promote innovation in Alberta, the following ranking could be established. Infrastructure and access to capital was cited as most important, followed by a supportive environment of entrepreneurs' efforts in terms of knowledgeable human resources. Government programs to promote R&D, such as R&D tax credits, turned out to be the third most important factor.

When asked how industry members share information, a large variety of answers were given: networks, food expos, workshops, focus groups, industry support agencies industry development groups, food commodity networks, and magazines. Only one

respondent noted that trade secrets were of great concern in considering the means for sharing information. Table 1 reveals further data on the rating questions.

The open-ended questions also suggest that one of Alberta's greatest advantages rests with its human resource pool. When asked why respondents set up a food business in Alberta, the excellent and well-educated human resource pool was frequently emphasized. The respondents also acknowledged support from a "well-intended" government and lower tax expenses.

The disadvantages of the Alberta food industry in terms of infrastructure were also revealed through the open-ended questions. Respondents emphasized that Alberta is 'out of the way' logistically as it is far away from the center of the Canadian food universe - Toronto. Alberta companies consider themselves to be disadvantaged by their distance from government heads, federally inspected plants, major trade routes, and major development centers. Survey respondents raised lack of commercialization experience in Alberta as another major concern. Perhaps the most striking disadvantage revealed by Alberta food industry participants is the industry's small scale and local perspective. Especially when compared to emerging food leaders like Brazil and Australia, the perceived inability to compete on world markets was striking.

Table 1: Survey Responses from Industry Participants

	Unacceptable	**Acceptable**	**Outstanding**	**Don't know/Not applicable**
How would you rate food innovation in the Edmonton/Alberta region?	36.4%	63.6%	0.0%	0.0%
Overall, how would you rate government support for food innovation?	36.4%	63.6%	0.0%	0.0%

More specifically…				
Local – Municipal	63.6%	18.2%	0.0%	18.2%
Provincial	18.2%	54.5%	9.1%	18.2%
Federal	45.5%	45.5%	0.0%	9.1%
Access to funds	54.5%	36.4%	0.0%	9.1%
Educational support and training	45.5%	45.5%	0.0%	9.1%
Regulation support and training	45.5%	54.5%	0.0%	0.0%
Research facilities	18.2%	81.8%	0.0%	0.0%
Networking	36.4%	45.5%	18.2%	0.0%
Technical expertise	36.4%	63.6%	0.0%	0.0%
Business Development assistance	45.5%	45.5%	0.0%	9.1%
Overall, how would you rate university support for food innovation?	36.4%	0.0%	0.0%	63.6%
Educated workforce	27.3%	54.5%	18.2%	0.0%
Accessibility of information	27.3%	45.5%	18.2%	9.1%
Research assistance (clinical trials, etc.)	45.5%	36.4%	0.0%	18.2%
To what extent do you think the interactions between clients, suppliers, government and University can be described by a "network", i.e. how would you rate the extent of this network?	81.8%	9.1%	9.1%	0.0%
How strong is this "network" in terms of innovativeness?	72.7%	18.2%	0.0%	9.1%
How would you rate the formality of this "network"? Networks can be more formal or informal. Is the current nature of the network too informal?	36.4%	18.2%	0.0%	45.5%
How adequate is knowledge/information shared in the "network"?	63.6%	9.1%	0.0%	27.3%
Is access free and open to all willing participants?	0.0%	72.7%	0.0%	27.3%
How would you rate the value of the benefits of the "network"?	36.4%	9.1%	9.1%	45.5%
Are all stakeholders involved and integrated?	54.5%	18.2%	0.0%	27.3%
How would you rate the innovation fostering done by industry associations?	54.5%	27.3%	9.1%	9.1%
How would you rate the following factors with respect to food innovation and entrepreneurship in Alberta?				
Taxes	27.3%	45.5%	0.0%	27.3%
Operation cost	9.1%	72.7%	0.0%	18.2%
Logistical location/Proximity to markets	54.5%	45.5%	0.0%	0.0%
Access to skilled labour	54.5%	45.5%	0.0%	0.0%
How would you rate access to capital for food innovation?	0.0%	0.0%	0.0%	0.0%
Grants	54.5%	18.2%	18.2%	9.1%
Loans (traditional)	45.5%	27.3%	0.0%	27.3%
R&D tax credits	27.3%	45.5%	9.1%	18.2%

Private investment	81.8%	9.1%	0.0%	9.1%
Venture capital (including angel investors)	81.8%	9.1%	0.0%	9.1%
How supportive is the local media?	27.3%	27.3%	18.2%	27.3%
How would you rate public awareness of food innovation in Alberta?	81.8%	18.2%	0.0%	0.0%
How does the future of food innovation and entrepreneurship in Alberta look?	36.4%	18.2%	18.2%	27.3%

Perhaps the most disappointing aspect of this study was the apathy of many of the people approached to participate. Out of the 55 senior managers, government officials etc. approached to participate in the survey, only thirteen responses were received before the end of the study. Of those who agreed to fill out the survey, less than 50% returned them. Only one of the surveys that had been sent out by regular post was returned. A possible limitation of the experimental design was that respondents were first contacted by phone to ensure that they agreed to complete the survey before the actual survey was sent to them. Since some respondents indicated a high interest over the phone, yet failed to respond by email or regular mail, it appears that future survey formats should consider telephone interviews, a web-based survey format or an in-person survey.

Overall, of those industry participants who responded, most were cautiously optimistic about the future of the food industry in Alberta. Moreover, all respondents were interested in improving the current business environment. Given the industry feedback, we conclude that one important factor in achieving this goal involves opening up communication channels and solidifying the formal and informal networks with strong and meaningful information flows. Indirect communication channels are presently available through government agencies such as the Food Processing Development Center, AVAC, and the Alberta Research Council; however, the usefulness of this

information is tempered because the information tends to be second hand or is limited due to agreements of confidentiality with clients. Further, the survey responses suggest that better communication facilities need to be developed in Alberta. One of the biggest hurdles to overcome is the fear of those in the Alberta food processing industry who worry that their trade secrets will be in jeopardy if they participate in a cluster.

Conclusions and outlook

This study has performed a selective literature review on innovation and innovation clusters, together with an empirical analysis of innovation issues empirically in the context of the Alberta food industry A mail-back survey was sent to selected firm managers, consultants, government officials, and university researchers. The survey results suggest that the Alberta food industry has not yet formed an innovation cluster. The results have to be interpreted with great caution since only 23.6% of individuals responded, leaving a total of only 13 questionnaires for data analysis. Given the survey responses, formal and informal networks do not appear to be highly developed; hence, industry participants have not formed the relationships fundamental to building a successful industry and innovation cluster. The survey gives evidence of limited information sharing and of industry participants not being convinced of the value of a more developed network. This is unfortunate as Alberta food companies appear to have both the knowledge base and natural endowments to create an innovative food industry, and possibly a cluster related to meat processing. Respondents suggested that the government- and University-support infrastructure is developed or growing and is

dedicated to a strong and competitive food industry in Alberta. The majority of the food companies surveyed cite Alberta's entrepreneurial spirit as one of Alberta's greatest advantages. Based on the survey results, it is predicted that the innovative environment in the Alberta food industry will improve and become healthier in the future.

In sum, from both the literature review as well as from the empirical part of this study, it appears that knowledge flows are critical to cluster formation. It would therefore be interesting to determine which channels of knowledge flows are used by participants in the Alberta food processing industry. This could enable government and industry participants to improve these channels, and thus build more competitive networks. Further, it would be desirable to explore some of the ideas that were brought forward by the survey participants, such as hosting a regional food expo or establishing a music and food festival in Alberta.

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APPENDIX
Study Survey

UNIVERSITY OF
ALBERTA

Rural Economy
Faculty of Agriculture, Forestry, and Home Economics

5-15 General Services Building
Edmonton, Alberta, Canada T6G 2H1

http://www.re.ualberta.ca
Rural.Economy@ualberta.ca

Tel: 780.492.4225
Fax: 780.492.0268

March 21, 2005

Thank you for participating in this study, the information you provide is greatly valued.

The purpose of the study is to examine innovation and entrepreneurship in the Alberta food processing industry. The intention is to gain a clearer understanding of the formal and informal measures that currently impact on innovative capability in the food industry, so as to gain a better understanding of the innovation environment. The information you provide will contribute to a project research paper, as part of a course at the University of Alberta, Faculty of Agriculture, Forestry and Home Economics. We do not believe that there are immediate benefits to you. However, we hope to obtain insights into innovation issues that bear some policy relevance and can thus be used for illustrative purposes in class. Further, parts of the results from this research may be published in aggregate form in a scientific journal.

This survey is completely voluntary and if at any time during the study you wish to discontinue you are free to do so. The survey should take about 20 to 25 minutes to complete. Once completed, please use the attached self-stamped envelope to mail the questionnaire back to Jolene Ali, 188 Darlington Crescent, Edmonton AB, T6M 2T2.

We don't foresee any risks to the survey respondents, however, if you have any questions or comments during or after the survey please feel free to contact me at (780) 432 0880, or Bodo Steiner (Dept. of Rural Economy, UofA) at (780) 492-0819, or Georgie Jarvis (Faculty of Agriculture, Forestry and Home Economics, UofA) at (780) 492-4931.

Thank you in advance for your participation.

Sincerely,

Jolene Ali
MBA/MAg Class 2005
University of Alberta

Profile Information:
Profile information will be used for statistical purposes only; information collected in the profile will not be used in conjunction with any specific person or company.

Business/Institution Name

Position

Address

Type of Business

__ Food/Beverage Mfg./Processor
__ Food Ingredient Mfg./Supplier
__ Processing Equip. Mfg./Supplier
__ Packaging Equip. Mfg./Supplier
__ Contract Processing/Packaging
__ Consulting
__ Educational Institution
__ Private Research Institution
__ Foodservice
__ Government
__ Independent Testing Lab
__ Scientific/Trade Assn.
__ Other (Specify)

Markets

Size (# of employees)

Approximate Sales - Canadian

Approximate Sales - Export

Formal Links with the University (Projects, personnel, etc.)

Informal Links with the University (former graduate, etc.)

Questionnaire
Directions: Please mark or type an (x) in the appropriate box

	Unacceptable	Acceptable	Outstanding	Don't know/Not applicable
How would you rate food innovation in the Edmonton/Alberta region?				
Overall, how would you rate **government** support for food innovation?				
More specifically…				
Local – Municipal				
Provincial				
Federal				
Access to funds				
Educational support and training				
Regulation support and training				
Research facilities				
Networking				
Technical expertise				
Business Development assistance				
Overall, how would you rate **university** support for food innovation?				
Educated workforce				
Accessibility of information				
Research assistance (clinical trials, etc.)				
To what extent do you think the interactions between clients, suppliers, government and University can be described by a "network", i.e. how would you rate the extent of this network?				
How strong is this "network" in terms of innovativeness?				
How would you rate the formality of this "network"? Networks can be more formal or informal. Is the current nature of the network too informal?				
How adequate is knowledge/information shared in the "network"?				
Is access free and open to all willing participants?				
How would you rate the value of the benefits of the "network"?				
Are all stakeholders involved and integrated?				
How would you rate the innovation fostering done by industry associations?				

	Unacceptable	Acceptable	Outstanding	Don't know/Not applicable
How would you rate the following factors with respect to food innovation and entrepreneurship in Alberta?				
Taxes				
Operation cost				
Logistical location/Proximity to markets				
Access to skilled labour				
How would you rate access to capital for food innovation?				
Grants				
Loans (traditional)				
R&D tax credits				
Private investment				
Venture capital (including angel investors)				
How supportive is the local media?				
How would you rate public awareness of food innovation in Alberta?				
How does the future of food innovation and entrepreneurship in Alberta look?				

Professional Comments: (Please write or type your responses in the boxes below)

What are the TWO most important factors that promote innovation in the Alberta food processing industry?
In your view, what is the ONE most important formal and informal means of information sharing between food industry members?

Is Edmonton/Alberta a good location to set up a food business? ➢ Top TWO reasons why/why not?
Please list the ONE main advantage AND disadvantage of Alberta, compared to other PROVINCES, when it comes to innovative capabilities in the food industry?
ADVANTAGE: DISADVANTAGE:
Please let us know of any additional comments you have that were not covered by the questions above?

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c. 2

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ENTREPRENEURSHIP: CLUSTERING. . .

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